FLORIDA POTATOES GROUNDWATER

12/23/13:

- Updated **Table 3b** to reflect correct maximum water capacity (half way between Porosity and Field Capacity) and revised table title.
- Updated **Table 2** to reflect crop height of 30 cm to be consistent with standard PRZM surface water scenario for Florida potato.
- Updated allowable depletion of available water (fraction) from 0.65 to 0.91 in **Table 2**. The allowable depletion in PRZM cannot be greater than 0.9; therefore, the value was capped at 0.9.

Metadata

The field used to represent potato production in Florida is located in St. John's County in northeast Florida within MLRA 155. The meteorological file, Jacksonville, Florida (13889.dvf), represents the MLRA region 153A. Florida produces 3 - 6% of the U.S. commercially grown supply and the value of potatoes is the 4th highest in the United States. The Northeast region of Florida has the highest potato crop production. St. Johns County produces 47% (21,000 acres) of the harvested potatoes in Florida. The potatoes are planted between October and February. Seeds are planted at a depth of 3 - 4 inches in rows 36 - 42 inches apart with 6 - 12 inches between plants (IPM Centers, 2008). Winter and early spring potato production supplies more than 35% of the early crop for the U.S. The Pomona fine sand is typical of the potato-growing region of the Hastings/St. Johns County area. The properties of this soil were obtained from the USDA Soils Data Mart (USDA, 2004).

Irrigation is generally required during initial plant growth, when plant water requirements rapidly increase. Water requirements during the final growth period of tuber development decrease. As with other root crops, continuous moderate levels of soil moisture must be ensured.

Seed pieces are planted at a maximum density of approximately 29,000 plants per acre. Approximately 110 days elapse between planting and maturity. Potato planting in this area runs from late December through early March, with harvest from late April through June. The vines are killed before harvest to prevent skinning and bruising of the mature tubers and to reduce harvest machinery interference by heavy foliage. Tuber harvest occurs 14-21 days after the vines are desiccated to allow time from the periderm to set on the tuber to reduce skinning and scuffing. Vine killing is accomplished with herbicides and occasionally by mowing. Hilling soil around plants to keep the tubers completely covered is important to prevent sunburn and greening of the tubers when the vines are killed.

The upper limit of the water table is 1.5 feet, generally in July to September (USDA Soil Data Mart). No information on typical well depths in the area could be found. In a ground water monitoring study in the potato-growing region of Putnam and St. Johns counties, Tilden and Weigand (1998) reported ground water pH values ranging from 7 to 8.

Table 1. PRZM 3.12 Climate and Time Parameters for Hastings/St. Johns County, Florida - Potatoes

Parameter	Value	Source
Starting Date	January 1,	Meteorological File – Jacksonville, FL (13889)

	1961	
Ending Date	December 31, 1990	Meteorological File – Jacksonville, FL (13889)
Pan Evaporation Factor (PFAC)	0.77	PRZM 3 Manual, Figure 5.9 (Suarez, 2006)
Snowmelt Factor (SFAC)	0	PRZM 3 Manual, Table 5.1 (Suarez, 2006)
Minimum Depth of Evaporation (ANETD)	25	PRZM Manual Figure 5.2 (Suarez, 2006). Use the mid-point of the range of values based on location of the crop scenario. If a crop region crosses one or more boundaries, select the average of the midpoints.

Table 2. PRZM 3.12 Crop Parameters for Hastings/St. Johns County, Florida – Potatoes

Parameter	Value	Source
Initial Crop (INICRP)	1	The simulation date starts before the emergence date of the crop. PRZM is currently untested for other conditions.
Initial Surface Condition (ISCOND)	1	The effect of this parameter is nearly irrelevant in EFED standard scenarios. This parameter specifies the curve number in place before the main crop is planted.
Number of Different Crops (NDC)	1	
Maximum interception of Storage of Crop (CINTCP)	0.1	PRZM 3 Manual (Suarez, 2006) Table 5.4
Maximum Rooting Depth (AMXDR)	60	Selection of root depth by professional judgment will be a compromise between a need to accurately describe evapotranspiration and accurately describing irrigation needs. Use USDA crop profiles.
Maximum Aerial Canopy Coverage (COVMAX)	40	
Surface Condition of Crop after Harvest	1	See scenario development guidance.
Curve Number (CN)	10	Typically for groundwater scenarios, curve numbers will be low and have little effect on simulated results (e.g., from A or B soils).
Max Dry Weight of Crop at Full Canopy (WFMAX)	--	Not Used in GW scenarios – place holder
Maximum Height of Canopy at Maturation (HTMAX)	30	Consistent with standard Florida Potato surface water scenario.
Number of Cropping Periods (NCPDS)	30	Set to weather data.
Date of Crop Emergence (EMD/EMM/IYREM)	15/02	http://www.ipmcenters.org/cropprofiles/docs/FLpotatoes.pdf
Date of Crop Maturation (MAD/MAM/IYRMAT)	01/05	http://www.ipmcenters.org/cropprofiles/docs/FLpotatoes.pdf
Date of Crop Harvest (HAD/HAM/IYRHAR)	01/06	http://www.ipmcenters.org/cropprofiles/docs/FLpotatoes.pdf
Crop Number Associated with NDC	1	Only one crop modeled
IPSCND	1	Assume bulk of material is incorporated into ground
Extra Water for Leaching	0.10	Typical
Available Depletion	0.90	Value calculated based on updated maximum water. Calculations are included in the attached excel file *"Scenario Update Calculations Dec 2013"*).
Max Rate of Water Supplied	7.0	Set high enough such that demand would be met on a single day.

Table 3a. PRZM 3.12 Pomona fine sand Soil Parameters for Hastings/St. Johns County, Florida		
Parameter	**Value**	**Source**
Soil Property Title (STITLE)		
Total Soil Depth (CORED)	400 cm	Standard GW Scenarios are for 10-meter soil profiles, with the last meter simulated as an aquifer. User determines effective depth.
Number of Horizons (NHORIZ)	8*	For the upper Horizons use USDA Soil Data Mart (Soil Survey Staff, 2008). Resolution need not be less than 1 cm in the top portion of the profile and not less than 20 cm in the remaining profile. The top profile is resolved into 1 cm increments in order to allow for accurate applications of pesticides into the soil surface. Below 10 cm, discretization is increased to 20 cm in order to simulate realistic dispersion.

* Using 8 horizons greatly simplifies the procedure for entering declining degradation rates. The first 2 horizons are 10 cm, and the next four are 20 cm thickness; these 6 horizons represent the aerobic degradation zone. The 7th horizon is variable depending on the depth to the simulated aquifer and represents the depths between the aerobic degradation zone and the water table. The 8th horizon represents the groundwater which starts at a variable depth depending on the parameterization, with the profile extending 100 cm below the water table. Note that the pore water degradation rate should never be less than the hydrolysis rate.

Table 3b. PRZM 3.12.2 Pomona Soil Horizon Input and Field Parameters for St. Johns County, FL - Potatoes

Horizon #	Horizon Thickness (THKNS) (cm)	Bulk Density (BD) (g/cm3)	Initial Soil Water Content (THETO)	Soil Drainage Parameter (AD)	Pesticide Hydrodynamic Solute Dispersion Coefficient (DISP)	Lateral Soil Drainage Parameter (ADL)	Thickness of Compartments in Horizon (DPN) (cm)	Field Capacity (THEFC) (cm3/cm3)	Maximum Water Capacity[1]	Wilting Point (THEWP) (cm3/cm3)	Organic Carbon (OC) (%)	Sand (%)	Clay (%)
1	10	1.31	0.13	0	0	0	1	0.13	0.32	0.090	4.19	93.2	0.001
2	10	1.73	0.13	0	0	0	5	0.13	0.24	0.090	0.78	94.6	0.2
3	20	1.78	0.07	0	0	0	20	0.07	0.20	0.021	0.18	92.0	0.6
4	20	1.65	0.08	0	0	0	20	0.08	0.23	0.009	2.03	91.6	1.5
5	20	1.65	0.11	0	0	0	20	0.11	0.24	0.051	2.03	91.6	1.5
6	20	1.75	0.19	0	0	0	20	0.19	0.26	0.040	1.05	92.8	0.3
7	200	1.75	0.19	0	0	0	50	0.19	0.26	0.007	0.19	94.0	0.001
8	100	1.75	--	0	0	0	50	--	--	--	0.16	78.8	8.5

NRCS, National Soils Characterization Database (NRCS, 2001) [HYPERLINK "http://soils.usda.gov/survey/nscd/"]
Draft Model and Scenario Development for Groundwater Estimates Using PRZM
1. 1-[bulk density/2.65 (*i.e.*, grain density)] = porosity; average field capacity and porosity

GW temperature: 21°C ([HYPERLINK "http://0.tqn.com/d/homerepair/1/0/o/3/-/-/climate_temps.jpg"])
Albedo: 0.2

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